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When Pastures Are Paved

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You've surely seen this story on your local news. The reporter stands with flooded houses in the background and describes the flood damage in a particular area of the city. The camera shows residents salvaging their water-soaked possessions while other flood victims, standing knee-deep in mud, tell the reporter of their personal losses.

Sometimes they blame a hurricane, a low pressure system, or even God Himself for the devastation to their neighborhood. Most tell the reporter that it is the city's fault that they are in their present dilemma.

Too often the victims are right. The flood they have just suffered could have been prevented by careful planning and stringent regulation by their city government.

"The first 20 years we lived in this house," a victim tells the reporter, "we had no flood problems. Now we live in constant fear of high water."

Others also testify to their worsening flood problems: "This is the third time our house has flooded in the last five years." "Last night the creek rose faster and higher than it ever has before."

"We're flooding because they are paving the pastures up there" all too often accurately describes the reason more urban areas in Texas flood each year.

The yards of mud-soaked carpet shown on the six o'clock news may well be directly related to the number of acres of pasture paved or the square feet of buildings constructed miles upstream from the actual flooding.

Before development, pastures, woods and fields "soaked up" much of the rainfall and slowed any excess which might run off. Developed areas, however, shed water quickly

and absorb little or none. Modern buildings and their surroundings remove water as quickly and efficiently as possible. Rooftop gutters channel rainfall rather than dispersing it around buildings. Curbs and gutters along city streets direct runoff into underground storm sewers rather than allowing it to flow into roadside ditches.

In other words, development in a watershed improves the efficiency of the water movement. Rainfall moves out of a developed area at a rate two or three times as fast as it did when the area was in its natural state. Unfortunately, the "improved" drainage affects the amount and the speed of water moving downstream.

Houston and Austin residents have been hit the hardest by urban flooding in recent years, but there are neighborhoods in almost every city in Texas which suddenly find themselves flood prone because of development somewhere else in the watershed.

Flood victims are not always private home owners, either. Large industries, entire shopping centers--even public hospitals and major highway intersections--flood in Houston. In Austin this summer, police headquarters, with its modern communications center located in the basement, was paralyzed because of flooding.

MODEL COULD HELP

"Cities presently design drainage systems without accounting for future effects of urbanization," says Larry Mays, a civil engineering professor at the University of Texas, Austin. "Many existing systems and systems presently under construction are inadequate because of upstream development."

In a study funded by the Texas Water Resources Institute, Mays developed a model for analyzing the effects of urbanization on city water systems.

He defines urbanization as basically the amount of impervious cover on a watershed. The percent of impervious cover in a watershed, according to Mays, affects downstream drainage by changing the total volume of water, the distribution of flow, peak rates of flow, frequency of peak rates, and quantity of the runoff.

Mays took data from storms occurring over a 15-year period with different levels of urbanization in the Waller Creek Basin in Austin and tried to fit parameters such as peak flow and volume into his model. He hopes that in the future Texas cities will use modeling techniques similar to his to determine the adequacy of existing and planned drainage systems. Mays' design uses the data of past storms to predict storms which haven't occurred yet in urban areas which haven't developed yet.

Traditionally, cities have tackled storm drainage problems by building larger drains, wider ditches, and higher levees. These are structural methods designed to move water out as quickly as possible, but generally contribute to more serious flooding downstream.

REDUCING IMPACT

There are effective methods, however, for cities to decrease or slow runoff. Cities can require the use of porous paving materials, on-site detention of rainwater, and the elimination of drain spouts connected to storm sewers. They can also prohibit the use of curbs and gutters in areas where roadside drainage would be practical.

- Pavement for streets, sidewalks, and parking lots makes up a large percentage of the impervious area of any urban area. The use of porous materials in these areas therefore has great potential for decreasing runoff.
- On-site detention is another very effective method for reducing urbanization impact on flood drainage in a city. This involves collecting and holding excess runoff before water enters a creek or drainage system. In many instances on-site detention is less costly than traditional structural methods. Detaining runoff can also help prevent water pollution, and stored water can sometimes be used to augment water supplies or to serve as a recreation facility.

Detention ponds are the most common way to hold runoff when excess runoff is a problem and sufficient open land is available. These can be dry depressions holding water only during flood stages or they can be lakes which also add value to surrounding property. Another detention method is to design parking lots to release water gradually.

A less common method of holding rainwater for a short period of time is rooftop storage. Flat or slightly sloping roofs can be equipped with detention drains to regulate the release of water. An alternate method of detaining stormwater on roofs is with a simple gravel dam that causes water to collect behind, then flow through at a reduced rate.

- Drain spouts can be disconnected or eliminated. These can be replaced by simple splash blocks or crushed stone to prevent erosion and to disperse water.
- When there is sufficient land available to handle the flows from nearby impervious surfaces, curbs and gutters can be eliminated to preserve or restore natural drainage patterns.

CITY POWER

Cities have the power to pass regulations with respect to drainage. The mechanism most frequently used by local governments is the subdivision plat approval process. Other alternatives used are zoning and building permit conditions, but these alternatives must be implemented as part of a comprehensive and sophisticated approach which few cities are prepared to undertake.

The subdivision plat approval process addresses drainage and other issues in a very direct manner. Subdivision regulations generally specify road widths, paving materials, roadway slopes, and drainage system designs. Cities can even require subdividers to improve and dedicate utility drainage easements at no cost to the city.

Cities have the authority to extend their subdivision control regulations including drainage system design approval into areas of extraterritorial jurisdiction. Texas counties

also have the power to specify conditions for subdivision plat approval within their jurisdiction, but their powers are more restricted than those of cities.

The Texas subdivision control system does not regulate the developer who chooses not to plat his subdivision, but there are a number of compelling reasons for a developer to comply with subdivision regulations. The city may refuse to provide utility service or refuse to maintain road and drainage systems if the plat is not approved by the city. Financial institutions such as savings and loan associations, banks, insurance companies and mortgage banks may withhold their financing unless the developer complies with city regulations. Federal programs such as Farmers Home Administration may require adherence with local regulations as a condition for making financing available.

NOT INEVITABLE

Increased urban sprawl seems inevitable in Texas. This very day, probably upstream from where you live or work, bulldozers level natural slopes, contractors lay asphalt and concrete, and roofers cover buildings. Areas which would have soaked up a good rain yesterday will shed the rainfall "like a duck's back" tomorrow. Rainfall which would have moved slowly toward a streambed yesterday, will gush swiftly off asphalt tomorrow.

This should not mean, however, that your area must suffer increasing flood risks. Your city should--as should all Texas cities--take firm regulatory steps to insure that future development does not unnecessarily endanger areas downstream and mean even more urban flood news stories.